WASHINGTON
SCIENCE TRENDS

HIGHLIGHTS

* Congressional Preview
* Scientists in Industry
* Maritime Research
* Thermoelastic Properties
* Research Checklist
* Publication Checklist

Vol. III No. 16 Jan. 4, 1960

A Troubled Congress -- Preview and Analysis

A bitter brew is being prepared in Congress for the nation's civilian and military space agencies. Months of investigations are now planned, with the strong possibility that programs and organizations now in existence will be severely disrupted in charges and counter-charges, political bickering and reorganization.

It is not unlikely that before the month is out President Eisenhower will respond to demands from the military for a "unified" space policy by offering proposals to change the present concepts of space program management.

Two major circumstances may add fuel to the fires. One is the fact that this is an election year so that the normal pattern of Congressional activity will be compressed into six months or less. And this pattern of stress will be abetted by the fact that two of the Senate's major Democratic critics of space programming are themselves possible Presidential candidates -- Senators Lyndon Johnson of Texas and Stuart Symington of Mo. Another space critic, Sen. Hubert Humphrey of Minn., is also after his party's nomination.

Pressures will also be intensified by any new Soviet achievements in the space field between now and the first political conventions in July. The U.S. has few major space attempts planned for this period -- and may be further embarrassed by the fact that a number of initial test firings are planned in the military astronautics field. Since these will employ new and largely untested systems the possibility of "failure" -- and criticism -- is greater.

These and many other factors can be expected to give vent to an overwhelming demand from both the House and Senate to "do something." Unfortunately, it was precisely this same type of pressure during 1958 and 1959 which led to the present jumble of hastily-formed, duplicating and rivalry-ridden space agencies and offices.

Another major phase of Congressional interest will be in the field of atomic energy. The influential Joint Congressional Committee plans hearings into setbacks in the food irradiation program, the role of the AEC National Laboratories in future developments and the "frontiers" of atomic research, including fusion power and the Plowshare program for peaceful uses of nuclear explosions.

Science, Engineering and Industry

Only about one in three scientists and engineers in American industry are actually engaged in engineering, research and development activities, according to a new survey by the National Science Foundation.

As of January, 1959, American business firms employed about 780,000 scientists and engineers - a gain of about four percent in a year. Engineering employment increased from about 605,000 to 630,000. The number of scientists increased from about 145,000 to 150,000.

Preliminary figures indicate that only about 35 percent of this total were actually engaged in engineering or scientific activities. The remainder were in sales, administration or other fields.

About one-third of the scientists and engineers in industry worked on aircraft and parts, electrical equipment, and chemicals and allied products. Each of these industrial groups employed more than 75,000 scientists and engineers. Each of two other industries employed from 50,000 to 75,000 -- machinery (except electrical) and engineering and architectural services. Next, employing from 30,000 to 50,000 scientists and engineers were construction, fabricated metal products and ordnance, primary metals, and motor vehicles and equipment.

These scientists and engineers represent about two-thirds of those actually employed in the Nation. The remainder work for government agencies, educational institutions, non-profit organizations, or are self-employed.

Employment Outlook

U.S. Department of Labor predicts favorable employment outlook for scientists and engineers into the 1960's.

Engineers are expected to benefit from the expansion of industry and the increasing complexity of industrial technology, as well as larger expenditures for research and development and continued high Defense spending.

Scientists will be needed in increasing numbers to teach, do basic research and develop applications and scientific knowledge in such fields as electronics, nuclear energy, medical research and space exploration. Mathematicians and physicists are expected to have particularly favorable job prospects. Well-trained biologists and chemists should also be in demand.

Programmers are singled out by the Labor Department as a new group of workers whose employment outlook is expected to remain very favorable through the early 1960's. Additional personnel will be needed where computers are in operation and where installations are in prospect. It is expected that the majority of jobs will be related to the programming of office and other business-type data.

(The Labor Department has issued a new 800-page edition of its Occupational Outlook Handbook as a guide to employment opportunities in some 600 different occupations. Copies are available at $4.25 from the Superintendent of Documents, Government Printing Office, Washington 25, D.C. or from regional offices of the Bureau of Labor Statistics in Atlanta, Boston, New York, Chicago and San Francisco)

Maritime Research Plans

Here is a summary of research and development plans as outlined during the past week by Clarence G. Morse, Maritime Administrator, U.S. Department of Commerce.

Hydrofoils: Maritime will continue to study possible construction of a 60-knot, 80-ton ocean-going hydrofoil craft. This study will be coordinated with the Navy's Bureau of Ships, Office of Naval Research and other units of the Defense Department "to assure that there shall be no duplication...and that the results of this project will be mutually beneficial to all agencies having an interest."

Morse says his agency will encourage private experiments on hydrofoils "wherever such projects hold the possibility of contribution to our overall knowledge and understanding of this specialized and as yet too little explored field."

Ground Effect Machines: Maritime is now planning a cooperative program with the Office of Naval Research for development of ground effect machines which will be capable of ocean operation. (More next week on Navy plans.)

Navigation and Safety: Maritime Administration has been soliciting proposals to design and construct an experimental radar computer capable of differentiating between safe and dangerous "targets" picked up on the ship's radar. The unit will have to maintain an accurate plot of all targets in the area and keep a permanent record of the ship's operation at all times. In addition, the equipment must give warning in the event a "target" is on a collision course with the vessel.

Other Projects: Development of a vertical main radio antenna is described as one of the major developments of the past year. The antenna is said to represent a significant saving in time and expense in laborious rigging and rerigging to permit cargo operations. Plastic lifeboats, installed on at least one ship during the year, are expected to eliminate an important item of maintenance and replacement expense.

(Further information on these and other projects reported in Washington SCIENCE TRENDS, Vol. II No. 25, Sept. 7, 1959)

Industrial Isotope Applications

A two-day Symposium on the Industrial Uses of Radioisotopes will be sponsored by the Atomic Energy Commission and various local and educational organizations in Philadelphia, January 19-20.

Industry representatives will review the economic implications of radioisotopes and discuss improvement in production and efficiency obtained by their use in gauging, radiography and industrial tracing. AEC speakers will review government programs of cooperation with industry and education.

(Management and technical personnel and educators may obtain additional information from Mr. Myles Standish, Executive Director, Commerce and Industry Council, Chamber of Commerce of Greater Philadelphia, 121 South Broad Street, Philadelphia 7, Pa.)

Determining Thermoelastic Properties

Two new techniques have been developed by the National Bureau of Standards for determining the thermoelastic properties of metals and alloys. They are expected to lead to improved spring materials for aircraft power plants.

* Requirement: Navy Bureau of Aeronautics asked the NBS to aid in problems associated with elevated temperatures in power plants of modern aircraft. This creates a requirement for metal springs that maintain stable deflection characteristics over a wide range of environmental conditions. Basic data was found to be required on the elastic constants of materials suitable for such springs.

* Solution: Two simple techniques were devised. One uses a pendulum assembly to test wire specimens; the other uses a sonic vibration apparatus for rods and prisms.

Pendulum Method: This technique uses an oven, photoelectric cell and lamp, timer, counter and electronic temperature recorder. The wire specimen is suspended through a hole in the top of the oven, where it is gripped by a chuck. When a small amount of twist is applied to an upper holding rod the pendulum oscillates about the axis of the specimen. The photoelectric cell and lamp are mounted just outside the rear of the oven, aligned with two holes in the oven wall. Once in each half cycle of oscillation, light from the lamp strikes a small mirror attached to the pendulum assembly, and is reflected back into the cell -- which then operates the counter and timer. The shear modulus of the wire is computed from the resonant frequency derived for the specimen and the dimensions and masses of the pendulum assembly.

Frequency range of this test is from a fraction of a cycle to 10 cycles per second. Test temperatures up to 525° fahrenheit are shown on the temperature recorder.

Sonic Vibration Method: In this method, a 6 inch rod or rectangular prismatic bar specimen is suspended by two asbestos springs from an electromagnetic driver and is enclosed in a furnace which operates at temperatures up to 1,000°F. The specimen is then excited to its resonant frequency by the driver and a variable audio oscillator. Vibrations, detected by a crystal pick-up, are shown as an expanded wave on a cathode ray oscilloscope. At this point the frequency of the oscillator is adjusted to the frequency of the specimen, indicated by the amplitude of the oscilloscope trace. This adjusted frequency is measured with an electronic events-per-unit-time counter. Thermoelastic properties can then be computed from the measurements obtained.

NASA Headquarters: The NASA has renamed three of the four major offices in its headquarters organization. They are: Office of Advanced Research Programs (formerly the Office of Aeronautical and Space Research), under direction of Ira H. Abbott, and charged with advanced research in aeronautics and space. Office of Space Flight Programs (formerly the Office of Space Flight Development), under direction of Dr. Abe Silverstein, charged with mission planning, payload design and development, and in-flight research and operation. Office of Launch Vehicle Programs, a newly-formed headquarters unit under Maj.Gen. Don R. Ostrander, USAF responsible for development and launch of space vehicles.

Research Checklist

( ) Chemical Processing Instrumentation: A null balance x-ray absorption instrument has been developed at the Atomic Energy Commission's Hanford, Washington laboratories for use in the measurement and control of chemical processing, including radioactive materials. The device is said to be an improvement on the so-called "absorptiometer" now used in similar applications. An x-ray source, adapted from a dental-type unit, is employed. Applications are reported to range from the manual handling of laboratory samples to continuous flowing process streams contained in stainless steel pipes.

(Detailed report available. 62 pages. $1.25. Write OTS, U.S. Department of Commerce, Washington 25, D.C. for Report HW-60898)

( ) Automatic Map Selector: Target Map Coordinator Locators are being developed for the Army Engineer Research and Development Laboratories as an aid to Army field commanders. The instrument is expected to select automatically the correct map from a compartment containing more than 11,000 different maps recorded on 70 millimeter color microfilm. An operator indicates the map coordinates of the point to be located and the selected map can be immediately projected onto a large viewing screen. The process is expected to take 15 seconds.

(R&D by Fairchild Camera and Instrument Corp., Syosset, N.Y.)

( ) Airborne Automatic Landing Approach System: Analog studies by the National Aeronautics and Space Administration indicate that it is feasible to control an airplane landing approach with an automatic control system which would not require complex equipment on the ground. The method investigated derives its error signals from airborne attitude-measuring equipment and airborne radar equipment tracking a target located at the end of a runway.

(Technical report available. Single copies free. Write NASA, CODE BID, 1520 H Street, N.W., Washington 25, D.C. for NASA Technical Note TN D-105)

( ) Cold Drawn Nickel Studies: Recently completed tests indicate that cold-drawing of nickel significantly increases the strength of the metal up to temperatures of 900° fahrenheit. However, above the recrystallization temperature of the metal this strengthening effect disappears. The studies are part of a fundamental research program designed to provide basic information on structural changes in metals under constant loads and at constant temperatures.

(Research by Thermal Metallurgy Laboratory, National Bureau of Standards, Washington 25, D.C.)

( ) Low-Friction Slide Rule: Special "ball-retainer" assemblies are being used by the Navy for a newly designed low-friction slide rule for satellite tracking computations. A minimum of precision machining is said to be required and slide action is unaffected by normal warpage.

Publication Checklist

( ) Shaping High-Purity Tungsten, a technical report just released on the recently announced process for making useful shapes of high-purity tungsten by "vapor deposition" techniques. Single copies free. (Write Publications-Distribution Section, U.S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa., for Report of Investigations No. 5539)

( ) U.S. - Soviet Space Sciences, one man's opinions on where the U.S. and the Soviet rate in various fields of space research. 24 pages. Single copies free. (Write Information Office, NASA, 1520 H St., N.W., Washington 25, D.C. for NASA Release No. 59-277)

( ) Project Mercury, a useful and largely non-technical report on planning and progress in the Project Mercury program for placing a man in orbit. 97 pages. Single copies free as available. (Write Committee on Aeronautical and Space Sciences, U.S. Senate, Washington 25, D.C. for Report No. 1014 - Project Mercury)

( ) Nuclear War Effects, rather grim testimony before Congress on the Biological and Environmental Effects of Nuclear War. A landmark in literature in this field. 966 pages. Single copies free. (Write Joint Committee on Atomic Energy, F-88, The Capitol, Washington 25, D.C. for Hearings, Effects of Nuclear War, just published)

( ) Clock Synchronization, a study by the National Bureau of Standards of methods for setting a number of widely separated clocks to precisely the same time and for keeping them in close agreement indefinitely. Useful in astronautics, missile technology and other fields and a fine gift for clock watchers. 86 pages. $1.25. (Write OTS, U.S. Department of Commerce, Washington 25, D.C. for NBS Technical Note 22)

( ) Scientific Documentation, the latest in a series of reports on various basic and applied projects throughout the world relating to documentation and communications. 102 pages. 50 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Publication NSF - 59-54)

( ) Soviet Physics Education, a report on the structure, content and character of the physics program at Moscow State University. 43 pages. Single copies free. (Write Publications Office, U.S. Office of Education, Department of Health, Education and Welfare for Information on Education Around the World Series, No. 11)

( ) Patent Practices - GSA, a critical report by a congressional group on patent practices of the General Services Administration, a U.S. Government Agency. 14 pages. Single copies free. (Write Patents Subcommittee, Committee on the Judiciary, U.S. Senate, Washington 25, D.C. for Preliminary Report - GSA Patent Practices)

( ) Hydraulic Research, a survey on research and development based upon reports by various hydraulic and hydrologic laboratories in the United States and Canada. 188 pages. $1.25. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Pub. No. C 13.10:227)